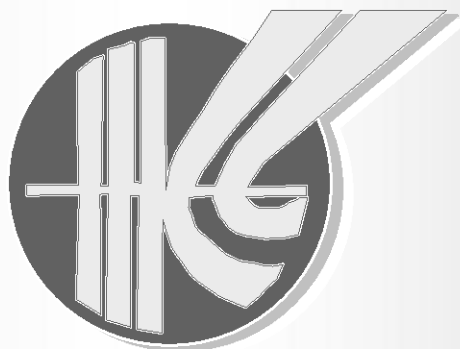


Candidate Name: _____ () Class: _____

4E/5N

KRANJI SECONDARY SCHOOL
Preliminary Examinations
Secondary 4 Express / 5 Normal (Academic)

CHEMISTRY
 Paper 1 Multiple Choice

**6092/01**

Tuesday

1 September 2026

1 hour

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READ THESE INSTRUCTIONS FIRST

Write your name, register number and class in the spaces provided.

There are **forty** questions in this paper. Answer **all** questions. For each question there are four possible answers, **A, B, C and D**.

Choose the one you consider to be correct and record your choice in **soft pencil** on the separate Answer Sheet.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

A copy of the periodic table is printed on page

The use of an approved scientific calculator is expected, where appropriate.

The total number of marks for this paper is **40**.

- 1 A titration is completed.

25.0cm³ of aqueous sodium hydroxide is added to a conical flask.

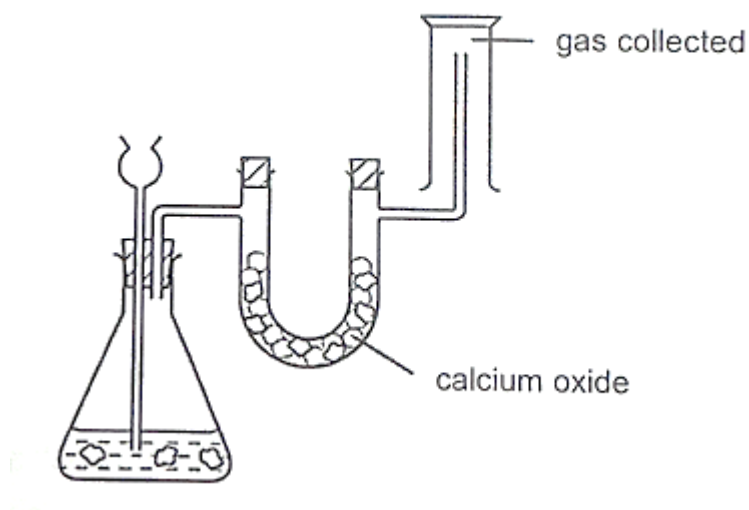
A few drops of methyl orange indicator are added.

Dilute hydrochloric acid is added slowly to the mixture until the colour changes.

Which row is correct?

	apparatus used to add alkali	apparatus used to add acid	colour change of indicator
A	measuring cylinder	burette	red to orange
B	pipette	burette	red to orange
C	pipette	burette	yellow to orange
D	pipette	measuring cylinder	yellow to orange

- 2 The diagram shows the setup of a chemical reaction that produces a gas. The gas is then dried and collected.



What could the gas be?

- A** carbon dioxide
- B** hydrogen
- C** oxygen
- D** sulfur dioxide

- 3** An impure sample of compound X has a melting point of around 120°C.
X is purified and its melting point is measured again.

Which row is correct?

	method of purification	melting point of pure X /°C
A	crystallisation	115
B	crystallisation	125
C	distillation	115
D	distillation	125

- 4** Three separate processes are listed

- 1 obtaining ethanol from an alcoholic drink
- 2 obtaining iodine from a mixture of iodine and sand
- 3 obtaining solid sodium chloride from sodium chloride solution

Which separate techniques would be used for these processes?

	1	2	3
A	fractional distillation	crystallisation	simple distillation
B	fractional distillation	sublimation	evaporation
C	simple distillation	crystallisation	filtration
D	simple distillation	sublimation	evaporation

- 5** When a substance changes state at constant temperature and pressure

- energy is released as stronger forces of attraction form between its particles
- the average distance between the particles changes very little

Which changes of state is being described?

- A** gas to liquid
- B** liquid to gas
- C** liquid to solid
- D** solid to liquid

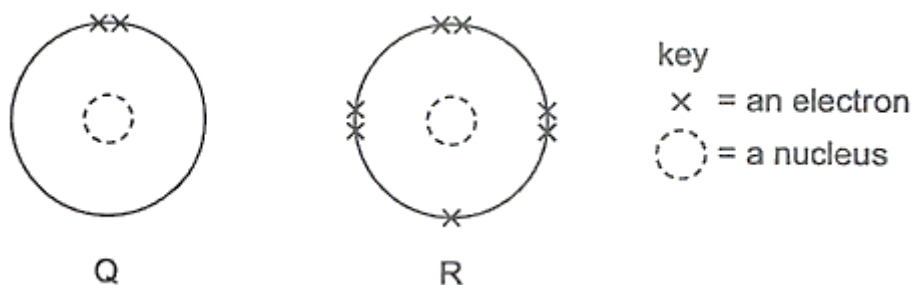
6 Which gas diffuses most slowly?

- A carbon dioxide molecule at 25°C
- B carbon dioxide molecules at 80°C
- C ethane molecules at 25°C
- D ethane molecules at 80°C

7 An ion X^{2-} has m nucleons and n electrons
What does the nucleus of an atom of X contain?

	number of protons	number of neutrons
A	$n - 2$	$m - n$
B	$n - 2$	$m - (n - 2)$
C	$n + 2$	$m - (n - 2)$
D	$n + 2$	$m - (n + 2)$

8 The diagram shows the outer shell electrons of the atoms of two elements, Q and R.



The sulfate of Q is insoluble

Element R is a gas at room temperature and pressure.

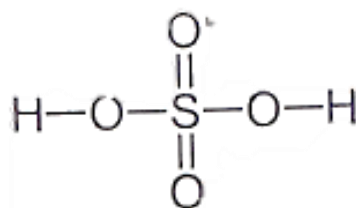
Which row could be correct?

	proton number of Q	relative atomic mass of R
A	12	35.5
B	12	80
C	56	35.5
D	56	80

9 Which compound contains covalent bonds?

- A calcium iodide
- B iron (II) sulfate
- C magnesium hydroxide
- D potassium phosphide

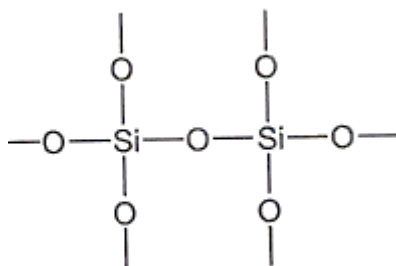
- 10 The diagram below shows the full structural formula of a molecule of sulfuric acid.



Considering all the electrons, which description best describes the arrangement of electrons in a molecule of sulfuric acid?

	total number of electrons involved in bonding	total number of electrons not involved in bonding
A	6	16
B	8	24
C	16	16
D	16	34

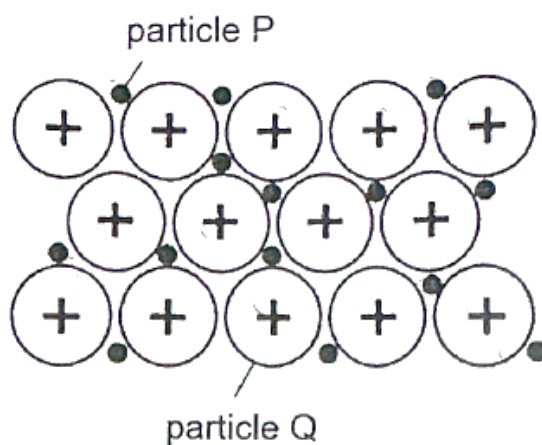
- 11 Silicon dioxide has a giant covalent structure. Each silicon atom is joined to four oxygen atoms by covalent bonds. Part of the structure is shown.



Which property would silicon dioxide be expect to have?

- A** a good conductor of electricity
- B** a high melting point
- C** reacts with dilute hydrochloric acid
- D** soluble in water

- 12 The structure of substance R is shown.



Which row correctly identifies substance R and particles P and Q?

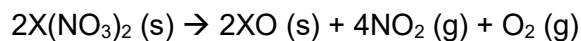
	substance R	particles P	particles Q
A	copper	electron	anion
B	graphite	electron	atom
C	lithium	electron	cation
D	sodium chloride	anion	cation

- 13 The formula of a chloride of element X is XC_l_4 . 103g of XC_l_4 contains 32g of X.

How many moles of X atoms does 103 grams of XC_l_4 contain?

- A** $\frac{71}{35.5} \times \frac{1}{4}$
- B** $\frac{71}{35.5} \times 4$
- C** $\frac{103}{35.5} \times 4$
- D** $\frac{103}{35.5} \times \frac{1}{4}$

- 14** On heating, the nitrate of element X decomposes.

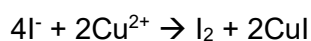


18.9g of $X(NO_3)_2$ is heated and 4.8dm^3 of nitrogen dioxide, measured at room temperature and pressure, is produced.

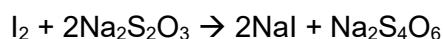
What is the relative atomic mass, A_r , of X?

- A** 47
- B** 65
- C** 124
- D** 127

- 15** Excess iodine ions react with 15cm^3 of a solution containing copper(II) ions to produce two products as shown in the following equation:



The resulting iodine formed from the above reaction requires 20cm^3 of 0.10 mol/dm^3 of sodium thiosulfate solution during titration. The equation for the reaction is shown below:



What is the concentration of copper(II) ions in the solution?

- A** 0.100 mol/dm^3
- B** 0.133 mol/dm^3
- C** 0.267 mol/dm^3
- D** 0.304 mol/dm^3

- 16** Brass is a mixture of copper and zinc. A sample of brass has a mass of 24.0g. When reacted with excess dilute sulfuric acid, 1.85dm^3 of hydrogen gas was collected.

What is the percentage of copper in the sample of brass?

- A** 20.9%
- B** 41.8%
- C** 58.2%
- D** 79.1%

- 17** Samples of dilute hydrochloric acid and dilute nitric acid were tested using Universal Indicator.

The sample of dilute hydrochloric acid has a pH of 4, while the sample of the dilute nitric acid has a pH of 2.

Which statement is correct?

- A** Hydrochloric acid is a weak acid while nitric acid is a strong acid
- B** Hydrochloric acid has a higher relative molecular mass than nitric acid
- C** The dilute hydrochloric acid sample has ionised more than the dilute nitric acid sample
- D** The dilute hydrochloric acid sample is less concentrated than the dilute nitric acid sample

- 18** Which of the following salts can be prepared by the same method?

- 1 calcium carbonate
- 2 magnesium nitrate
- 3 potassium chloride
- 4 zinc sulfate

- A** 1 and 2
- B** 1 and 3
- C** 2 and 3
- D** 2 and 4

- 19** A salt has the chemical formula $(\text{NH}_4)_2\text{Fe}(\text{SO}_4)_2$. Excess aqueous sodium hydroxide was added to a solution and the mixture was heated. The mixture was left to stand.

Which of the following observations would **not** be made?

- A** A green precipitate was formed.
- B** A pungent gas that turns damp red litmus blue
- C** The precipitate dissolves in excess aqueous sodium hydroxide
- D** The precipitate turned red-brown on standing

- 20** In an experiment conducted in school, Eren added 1.5g of copper(II) carbonate to 10.0cm^3 of 1.0 mol/dm^3 aqueous sulfuric acid.

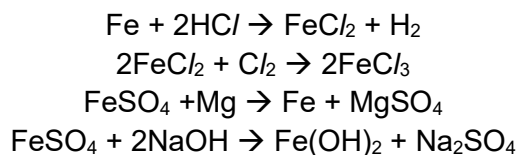
What would Eren observe at the end of the reaction?

- A** A black solid in a colourless solution.
- B** A blue solution
- C** A blue solid in a blue solution
- D** A green solid in a blue solution.

21 What is the source of hydrogen in the industrial production of ammonia?

- A** cracking of crude oil
- B** electrolysis of aqueous sodium chloride
- C** fractional distillation of liquefied air
- D** reaction of a Group 1 metal with water

22 Equations for some reactions of iron and iron compounds are shown.



How many of these is/are a redox reaction(s)?

- A** 1
- B** 2
- C** 3
- D** 4

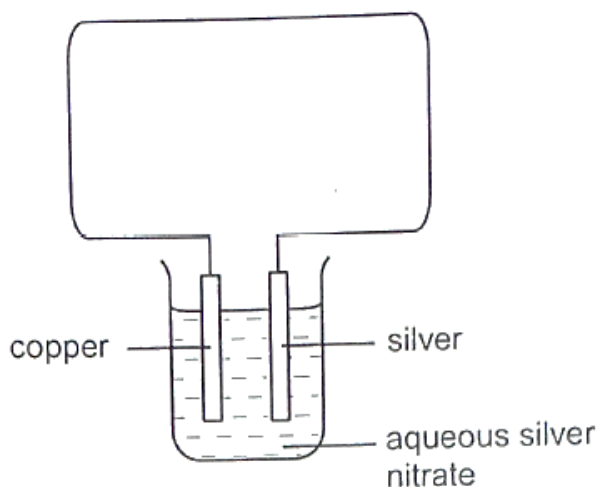
23 Tin can be obtained by the electrolysis of its molten chloride. The properties of the metal and its chloride are as follows:

	melting point/°C	boiling point/°C	density /g/cm ³
tin	231	2260	7.28
tin chloride	246	652	3.95

Which of the following statements about the electrolysis of molten tin chloride is true?

- A** The metal forms as a liquid above the molten chloride.
- B** The metal forms as a liquid below the molten chloride.
- C** The metal forms as a solid above the molten chloride.
- D** The metal forms as a solid below the molten chloride.

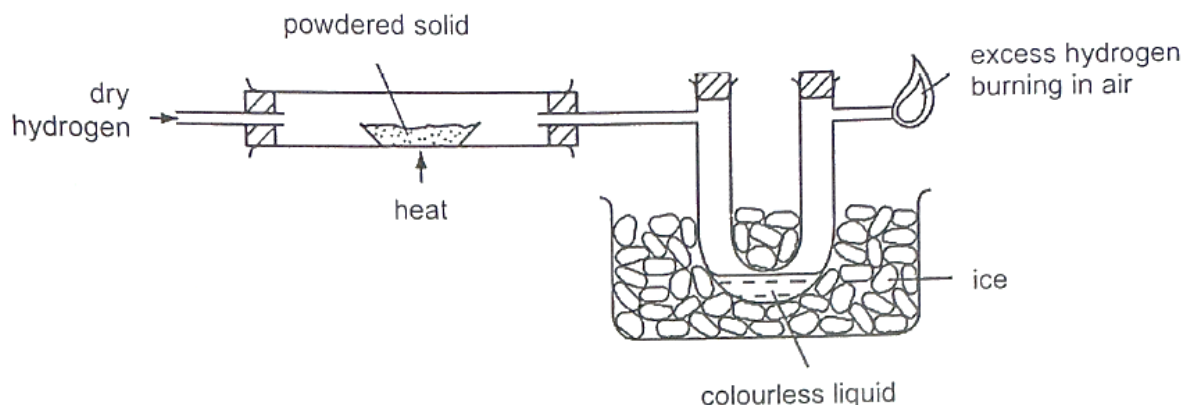
- 24 The diagram shows a simple cell that can conduct chemical energy into electrical energy.



Which statement is correct?

- A Bubbles of gas will form at the copper electrode
 - B Electrons pass from the copper electrode to the silver electrode through the silver nitrate electrolyte
 - C The concentration of silver ions in the solution will increase
 - D The solution will turn blue.
- 25 Which statement about a fuel cell in a car is correct?
- A Hydrogen is burned in oxygen to produce electricity
 - B Hydrogen is reduced.
 - C It is an endothermic reaction
 - D Water is the only chemical product
- 26 Which statement correctly describes the properties of Group 17 elements?
- A The elements are good oxidising agents
 - B The elements forms ions with more protons than electrons
 - C The melting point of the elements decreases down the Group.
 - D The reactivity of the elements increases down the group.

- 27** Dry hydrogen gas is passed over a powdered solid and then through a cooled U-tube before the excess hydrogen gas is burned in air



A colourless liquid collects in the U-tube.

What could be the powdered solid?

- A** calcium oxide
 - B** lead(II) oxide
 - C** magnesium oxide
 - D** zinc oxide
- 28** Equal masses of magnesium carbonate and copper (II) carbonate are heated at the same temperature until no further changes is observed.

Which carbonate decomposes most quickly, and which one produces a greater volume of carbon dioxide gas?

	higher rate of decomposition	greater volume of carbon dioxide gas produced
A	copper(II) carbonate	magnesium carbonate
B	copper(II) carbonate	copper(II) carbonate
C	magnesium carbonate	magnesium carbonate
D	magnesium carbonate	copper(II) carbonate

- 29 Ships made of steel often have pieces of magnesium attached to them to protect the steel from corrosion.

Which equation shows a reaction that occurs when magnesium is used to protect steel from corrosion?

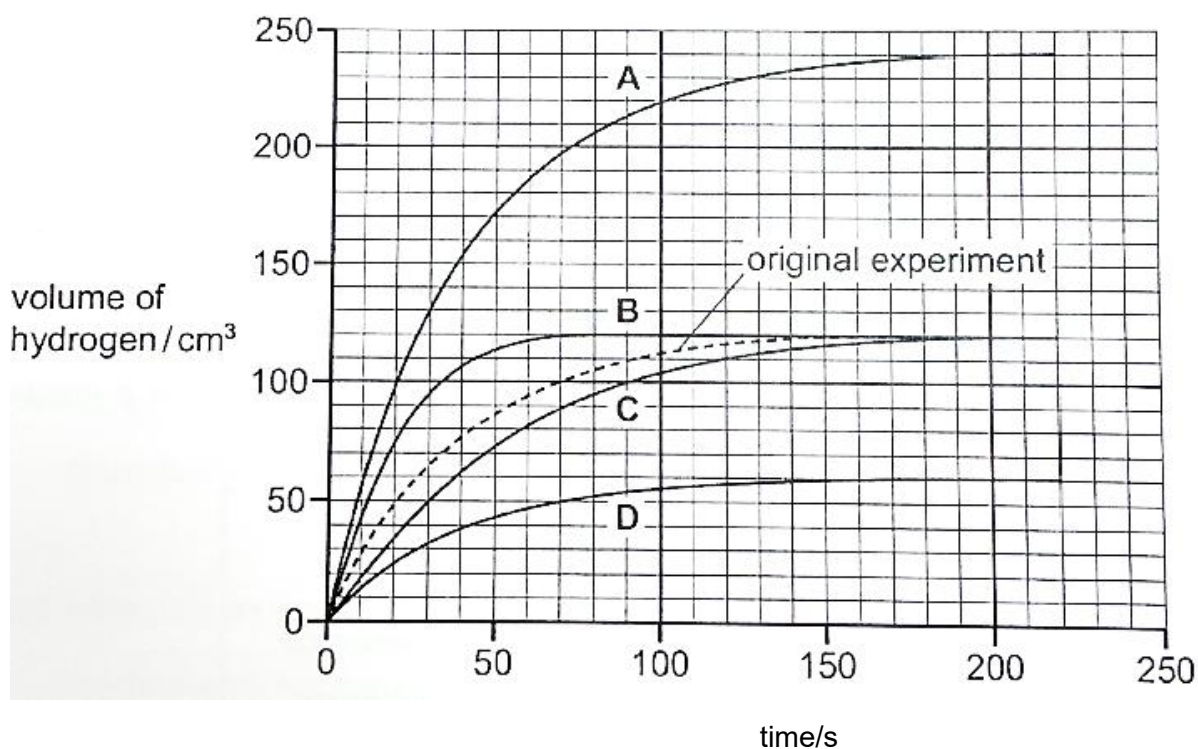
- A $\text{Fe (s)} \rightarrow \text{Fe}^{2+} \text{ (aq)} + 2\text{e}^-$
B $\text{Fe (s)} \rightarrow \text{Fe}^{3+} \text{ (aq)} + 3\text{e}^-$
C $\text{Mg}^{2+} \text{ (aq)} + 2\text{e}^- \rightarrow \text{Mg (s)}$
D $\text{Mg (s)} \rightarrow \text{Mg}^{2+} \text{ (aq)} + 2\text{e}^-$

- 30 A student adds excess magnesium ribbon to 20cm^3 of 0.5 mol/dm^3 ethanoic acid.

The hydrogen gas produced is collected, and its volume is measured every 10 seconds

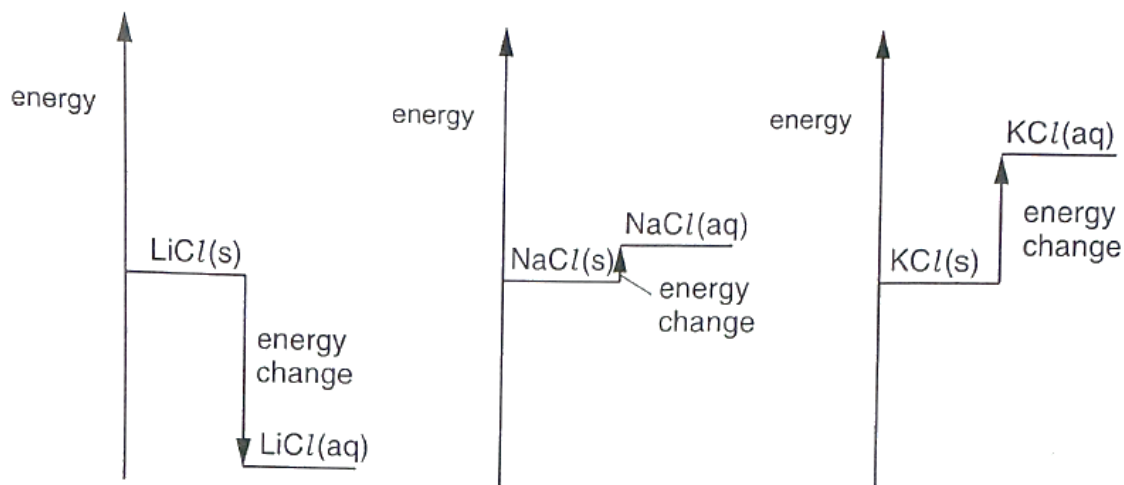
The experiment is repeated using the same mass of magnesium ribbon with 20cm^3 of 0.5 mol/dm^3 sulfuric acid.

Which graph shows the results of the second experiment?



31 Lithium chloride, sodium chloride and potassium chloride are all soluble in water

The diagrams show the energy change when each salt dissolves in water.



A student dissolves each compound in water and measures the temperature change that occurs when the compound dissolves.

He uses the same amount of each compound and same amount of water each time.

What results should the student expect from this experiment?

- 1 When lithium chloride dissolves, the temperature decreases
- 2 The temperature decrease is greater for potassium chloride than for sodium chloride
- 3 The magnitude of the temperature change is greatest when lithium chloride dissolves.

- A** 1 and 2
B 1 and 3
C 2 and 3
D 3 only

32 Catalysts alter the rate of chemical reactions.

Which statement(s) correctly describe(s) the effect(s) of adding a catalyst to a reaction?

- 1 All reactants have more energy and move faster
- 2 The activation energy is lowered
- 3 More reactant particles collide with enough energy to react

- A** 1 and 2 only
- B** 1, 2 and 3
- C** 2 only
- D** 2 and 3 only

33 Hydrocarbons and alcohols can be used as fuels

The tendency of a fuel to ignite spontaneously (catch fire) is measured by its octane number. The lower the octane number, the more easily it ignites.

fuel	hydrocarbon / alcohol	octane number
1	butane	93.6
2	butanol	103
3	ethane	108
4	ethanol	108.6
5	hexane	24.8
6	pentane	61.7

statement 1 The octane number decreases as the chain length of the hydrocarbons increases.

statement 2 Alcohols ignite more easily than alkanes

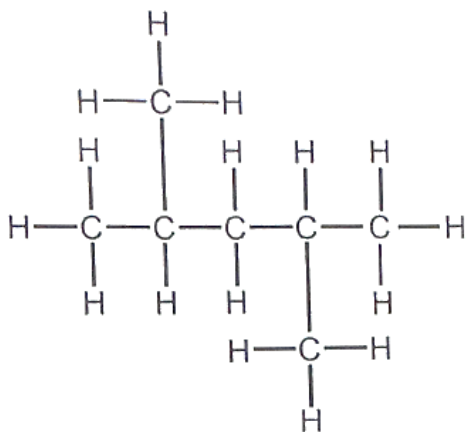
Based on the data above, which statement(s) is/are correct?

- A** both statements
- B** neither statements
- C** statement 1 only
- D** statement 2 only

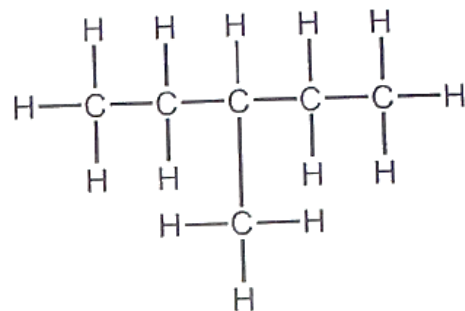
34 Alkanes are hydrocarbons containing hydrogen and carbon only.

Structures 1, 2, 3 and 4 are alkanes.

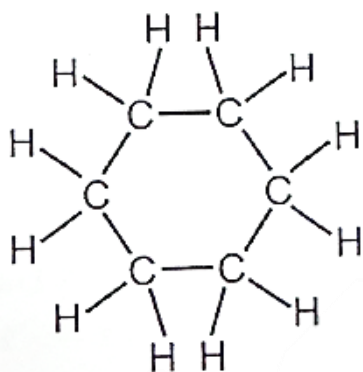
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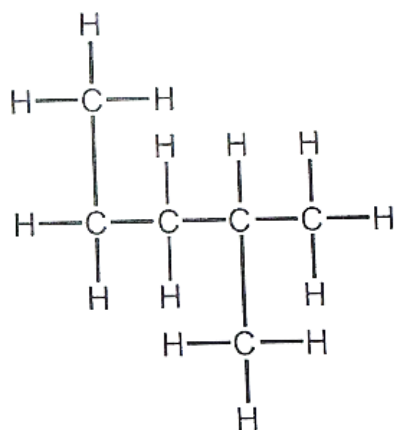
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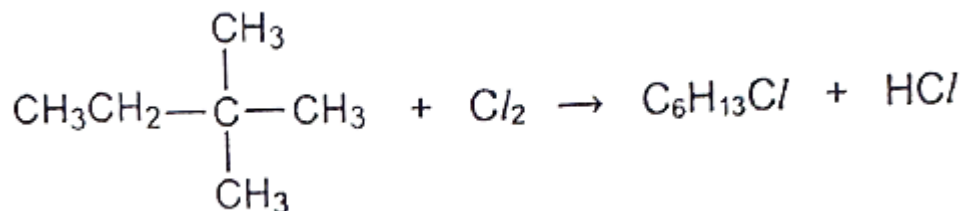
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Which pair of structures are isomers?

- A** 1 and 2
- B** 1 and 4
- C** 2 and 3
- D** 2 and 4

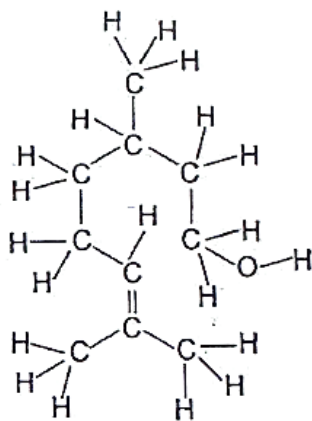
- 35 In the presence of ultraviolet light the hydrocarbons below undergoes a substitution reaction with chlorine.



How many different products of formula $\text{C}_6\text{H}_{13}\text{Cl}$ can be formed?

- A 2
B 3
C 4
D 5
- 36 Which alkene, on the addition of steam, can produce only **one** alcohol?
- A $\text{CH}_3\text{CH}_2=\text{CH}_2$
B $\text{CH}_3\text{CH}_2\text{CH}=\text{CH}_2$
C $(\text{CH}_3)_2\text{C}=\text{CHCH}_3$
D $(\text{CH}_3)_2\text{C}=\text{C}(\text{CH}_3)_2$
- 37 Citronellol is found in plants such as roses and lemongrass. It is commonly used in fragrances and cosmetics.

The diagram shows the structure of Citronellol.



Which statement about citronellol is **not** correct?

- A Citronellol can form a polymer with the same empirical formula.
B Citronellol can react with hydrogen in the presence of a catalyst.
C Citronellol can react with sodium hydroxide to form a salt and water
D Citronellol can turn purple acidified potassium manganate (VII) solution colourless

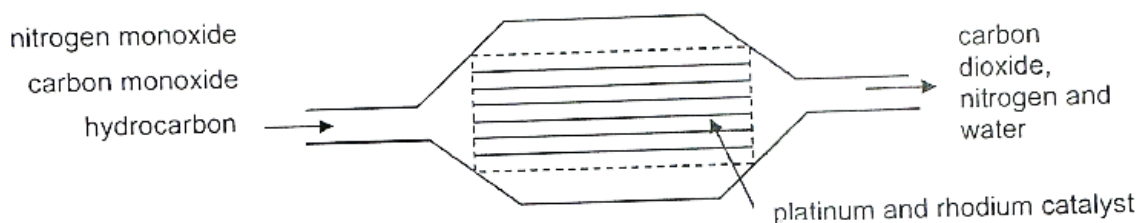
- 38 An alcohol, X, was fully converted into a carboxylic acid.

Neutralisation of the acid with calcium carbonate gave a salt with the formula $(\text{C}_2\text{H}_5\text{CO}_2)_2\text{Ca}$.

What was alcohol X?

- A $\text{C}_2\text{H}_5\text{OH}$
- B $\text{C}_3\text{H}_7\text{OH}$
- C $\text{C}_4\text{H}_9\text{OH}$
- D $\text{C}_2\text{H}_5\text{CO}_2\text{H}$

- 39 The diagram represents a section a catalytic converter in the exhaust system of a car, where air pollutants are converted into carbon dioxide, nitrogen and water vapour.



Which reaction(s) take(s) place in this catalytic converter?

- 1 carbon monoxide reacts with hydrocarbons
- 2 hydrocarbons react with oxygen
- 3 nitrogen monoxide reacts with carbon monoxide

- A 1 and 2 only
- B 1, 2 and 3
- C 2 only
- D 2 and 3 only

- 40 The depletion of the ozone layer in the upper atmosphere reduces the Earth's natural protection against harmful ultraviolet radiation.

Which compound would cause the most severe depletion of the ozone layer?

- A CCl_3F
- B CF_4
- C CHClF_2
- D CH_2F_2